No. II.

OXY-HYDROGEN BLOWPIPE.

The SILVER ISIS MEDAL *was presented to Mr. W.* MAUGHAM, *for his oxy-hydrogen blowpipe, a Model of which has been placed in the Society's Repository.*

The following communication has been received from Mr. Maugham.

Adelaide Street Gallery,
May 12th, 1835.

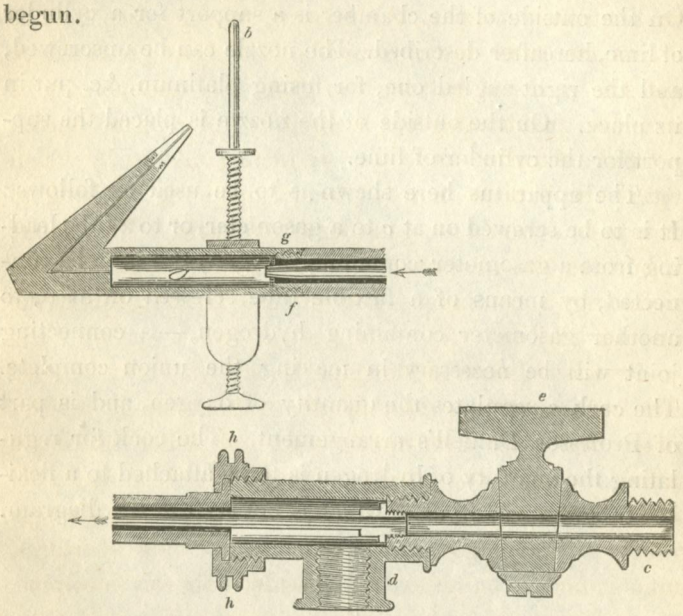
SIR,

HAVING had occasion to make a great number of experiments during the last two years with oxygen and hydrogen gases, and having found all the blowpipes for burning these gases in a mixed state, on an extensive scale, very inefficient for my purpose, I have been under the necessity of contriving an apparatus, easily manageable, and entirely free from danger. It would be useless to enter into even a slight history of the several contrivances that have already been laid before the public, from time to time, for burning these gases with safety in a mixed state, as I am aware that the Society are fully conversant with all that might be adduced on the subject. I may, however, be allowed to state, that such contrivances, although highly ingenious, can, in reality, only be considered as toys in the hands of bold operators; for they are by no means calculated to answer any purpose by which the public can be benefited; for they cannot be trusted in the hands of ordinary manipulators. By means of the blowpipe which I herewith transmit, and which I

trust you will submit to a full investigation and trial, these gases may be burnt for any length of time without any chance of explosion, as they are merely mixed in a very small quantity at once, the mixture taking place only as fast as the gases are consumed. The heat produced by this safe mode of burning the gases may undoubtedly be turned to an advantageous account by different mechanics, in fusing platinum and other refractory metals, by which means the expense now attendant upon the working of such metals would be considerably reduced. This mode of burning the gases will likewise be found eligible for producing a continuous and intense light through the medium of lime.

Professor Daniell's blowpipe is one that may be used with perfect safety, but, in my estimation, it labours under two great disadvantages, one of which is, that a sufficient degree of heat for many purposes cannot be obtained by it; the other is, that the great consumption, or rather waste, of gas, occasioned by its wide apertures, unfits it for use on an extensive scale. In this blowpipe, the gases are brought along separate tubes, one of these tubes traversing the interior of the larger one, so as to allow the gases to come in contact only just where they respectively escape into the atmosphere. As this is already in the hands of most chemists who have any thing to do with oxy-hydrogen blowpipes, instead of beginning with a mode of conveying the gases *ab origine* into the chamber which I am about to propose to the Society's consideration, I will describe a method of rendering it complete, and fully efficient for all the purposes to which the safe combustion of the gases can be applied. My motive for building upon Professor Daniell's blowpipe is merely to serve the economical purpose just alluded to;

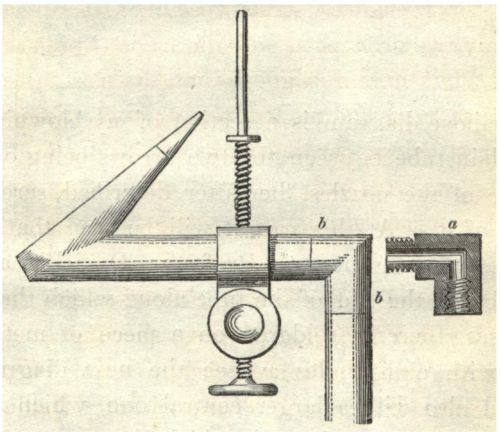
for it will presently be perceived, that it would have been quite as easy to have constructed one altogether different as to have undertaken to finish what that philosopher has begun.



The above diagram is a section of my blowpipe (part of the plain tube between the two arrows being omitted), with one of the nozzles, hereafter described, screwed on the end of it. At this part it will be seen that I have made a little addition to Professor Daniell's arrangement; for, at the end of the tube along which the hydrogen passes, there is soldered on a piece of metal, perforated with eight holes *x* (see the next diagram but one), and also with a larger central one, which receives the end of the pipe through which the oxygen passes: these smaller holes are not, as might at first be expected, to answer the purpose of wire-gauze, and to prevent

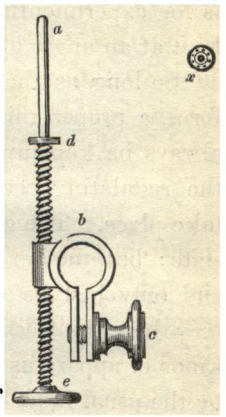
explosion ; but are merely to divide the stream of hydrogen, so as to render its mixture with the oxygen in the chamber into which the pipe opens more uniform. On the outside of the chamber is a support for a cylinder of lime, hereafter described. The nozzle can be unscrewed, and the right-angled one, for fusing platinum, &c. put in its place. On the outside of the nozzle is placed the support for the cylinder of lime.

The apparatus here shewn is to be used as follows: It is to be screwed on at *c* to a gasometer, or to a tube leading from a gasometer, containing oxygen, and is to be connected, by means of a flexible tube screwed on at *d*, to another gasometer containing hydrogen, — a connecting joint will be necessary in making the union complete. The cock *e* regulates the quantity of oxygen, and is part of Professor Daniell's arrangement. The cock for regulating the quantity of hydrogen is to be attached to a flexible tube screwed in at *d*, which is not seen in the diagram.

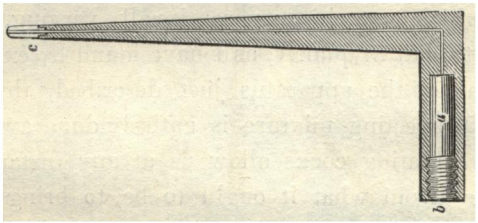


By having an elbow-joint, a section of which is seen at *a* in the annexed figure, and screwed in its place at *b b*,

a vertical position of the shaft of the blowpipe may be obtained, which will be found convenient for placing the lime-light in a parabolic reflector.



The opposite diagram shews the support for the lime without the nozzle; *a* the rod on which a ball or cylinder of lime, &c. is to be placed,—the lime, &c. having, of course, a hole drilled through it, and turned perfectly cylindrical; *b* the ring which slips on the nozzle of the blowpipe; *c* a screw for fixing the ring tight; *d* a small plate of metal on which the lime rests; *e* a screw for raising or lowering the lime, so as to expose a fresh surface of the earth as often as may be necessary. This does away with the necessity of employing a watch or clock-work motion, in ordinary experiments, with the light in question.



The annexed figure is a section of one of the nozzles of the blowpipe I beg to propose, shewing a chamber *a* in which the gases mix previously to being burnt; *b* is a female screw for fitting it on the end of a Daniell's blowpipe. The jet *c* is of platinum. This nozzle is bent at right angles, and, when fixed on the blowpipe, the jet for delivering the mixed gases points perpendicularly down-

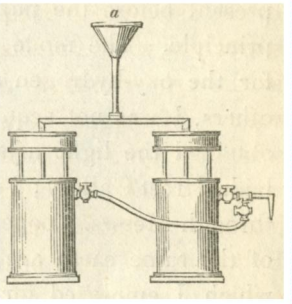
wards, and is intended for fusing platinum, and other metals difficult of fusion, the metal being supported on a proper rest. The oblique nozzle shewn in the first figure is for experimenting with light by means of lime. It is bent at an angle of about 45°.

So long as the pressure at each gasometer is kept uniform, a proper mixture of the gases in the chamber will always be kept up after it has once been established by the regulating cocks, and an explosion cannot possibly take place. The gases are thus burnt certainly in a *mixed* state; but they are only mixed in a very trifling quantity, and only just before they escape from the blowpipe. It may here be necessary to observe, that in the several kinds of apparatus for burning the gases in a mixed state by the usual mode of mixing them, the mixture can never scarcely be what it precisely ought to be; for they are mixed in the proportions of two volumes of hydrogen and one volume of oxygen, no regard being had to the impurities which are always present in these gases as ordinarily obtained; which impurities are continually varying, not only in quantity, but in quality, as I have found by experience. By means of the apparatus just described, this inconvenience respecting mixture is entirely done away with; for the regulating cocks allow us at any instant, if the flame vary from what it ought to be, to bring it to its proper state. It is true, the mixture is made by guess; but a little experience will soon enable the operator to obtain at once the due proportions. If the hydrogen be in excess, a large bushy flame will be produced; if the oxygen be in excess, the flame will be extinguished: the flame produced by the proper mixture is so characteristic, that when once seen it is easily remembered. When the gases are thrown upon lime and the other earths, we shall

have a flickering light, if the mixture of the gases be not properly adjusted ; and this flickering we always have, when the gases are mixed in the manner to which I object.

Another addition to Mr. Daniell's apparatus is a connecting piece at *h h* in the first diagram, which being slightly unscrewed will enable the jet to be placed in any direction in the plane of a circle whose diameter shall cut the blowpipe transversely at right angles.

With respect to the gasometers to be used with this apparatus, I have to observe, that on a small scale, those who are in possession of two gasometers, constructed on Mr. Pepys's principle, may obtain an equal pressure by employing one funnel, terminating in a branched tube attached to each gasometer, as shewn in the annexed figure. Under ordinary circumstances, an assistant may pour water in the funnel *a*, and a *little* variation in the height of the column which will occur by this means, does not much affect the flame, and may be always counteracted by means of the regulating cocks. When there is convenience, the supply of water to the funnel may be regulated by a ball-cock attached to a pipe passing from a cistern, the ball being placed in the water in the funnel. This mode of proceeding, however, only relates to the use of the gases on a small scale, as in the lecture-room, &c. When the gases are to be used more extensively, and applied to the purposes which I have already proposed, a better mode of obtaining equal pressure will very readily suggest itself. It is to be remembered that, in describing



a blowpipe, I cannot be expected to say much respecting gasometers: all I wish is, that the pressure may be always uniform, and equal to that of a column of water of at least twenty-four inches in height.

I trust you will at once be convinced that the mode above proposed is entirely free from danger. I may say with truth that I have burnt thousands of gallons of oxygen and hydrogen gases in this way, and have never yet met with the slightest accident.

In conclusion, I beg to observe, that I by no means wish to impress upon the Society that I have been the first to burn oxygen and hydrogen from separate vessels; but that this mode which I have proposed has been the result of my own experiments. I believe there is no blowpipe at present before the public for burning the gases on this principle. The mode of producing the light upon lime for the oxy-hydrogen microscopes by Cary, Cooper, and others, I was not acquainted with until long after I had obtained the light myself for the proprietors of the Adelaide Street Gallery; I always employed balls of lime, and through Messrs. Cooper and Cary I learnt that cylinders of the same earth are decidedly better. The apparatus which I employed for a microscope commenced by Mr. Tully, is still at the Gallery, and is open to the inspection of any person who wishes to see it.

I am, Sir, &c. &c.

A. Aikin, Esq.
Secretary, &c. &c.

W. Maugham,
Lecturer on Chemistry,
Adelaide Street Gallery, and Charing Cross Hospital.

P. S. If platinum be fused upon charcoal it will be brittle, and unfit for the purposes to which it is usually

applied. I have no doubt it is converted into a *carburet*. I have tried several substances as a support for it, of which I find Stourbridge clay the best. Mr. Johnson, of Hatton Garden, has been kind enough to witness some experiments with the blowpipe, and he suggested the use of the above material as a support. He brought with him some bone-ash cupels, but they were readily fused. All substances, indeed, seem to fuse under the intense heat produced by the combustion of the gases in question. I find the best mode of fusing platinum is to keep adding gradually to the fused mass small pieces of the metal. When an ounce or more has thus been acted upon, the metal will be in fusion at the surface, but will become solid at the bottom. We may thus go on welding or agglutinating the platinum to any extent. Before rolling or using the metal in any other way, be careful to cut off that end which was next the support, as this becomes incorporated with a portion of silica, which renders it unfit for working. By adhering to the principle laid down, by having gasometers sufficiently large (and their size may be increased to any extent with perfect safety), and by having the orifice whence the gases issue augmented to a considerable extent, I am convinced platinum may be fused in almost any quantity. I have succeeded in agglutinating more than half a pound of this metal by the process just described.